

Graph II shows the results of force tests on the three custom PVA nibs. Two observations should be noted. First, the force on the electronic balance is significantly less than that of the commercial nibs for equivalent vertical displacement. For a 3 mm movement, less than 1 gram of force was exerted. The second item to be noted is that for the first 3 mm of pen movement, little change in force was recorded. This is a result of the fact that the nib tip and nib shaft were of similar diameters allowing the nib shaft to flex.

Graph III compares test data of displacement versus force for three commercial nibs and the three custom PVA nibs. The difference in writing force between the three custom nibs and the three commercial nibs is dramatic.

Graph IV (FIG. 7) shows pen displacement (vertical motion) versus pressures generated by four nibs. A representative PVA nib was compared to each of the three commercial nibs and from the above experiment, contact area was measured. Force (in grams) divided by contact area (in square centimeters) yielded pressure (grams/square centimeter). Because two of the commercial nibs are extremely inflexible, it was not possible to flex them to the three or four mm range achieved by the PVA nibs of the instant invention. It is apparent from the data tables and accompanying graphs that the custom PVA nib is orders of magnitude more flexible than any of the three commercial nibs.

FIG. 1 shows one embodiment of the instant invention in which decorating tool 10 comprises a cylindrical reservoir containing a liquid, edible food coloring agent. Preferably, said food coloring agent contains a hygroscopic material such as glycerol or propylene glycol to prevent evaporation of the food coloring and promote storage life. Additionally, a preservative, for example, propylparaben, may be employed to prevent spoilage. A housing 11 has at one distal end a nib 12 which is hydraulically coupled to the fluid contents of housing 11. Said coupling may be of a capillary nature employing various fibers, foams, or other materials as are known in the art. A protective cap 13 serves to protect nib 12 from damage and further to prevent the aforementioned food coloring agent from evaporation or contamination when the device of the instant invention is not being used. Optionally, fragrance or flavor agents may be used either with or in place of the food coloring agent if desired. An internal food coloring agent reservoir 14 shown in FIG. 2 may be used to assist in retaining the fluid and controlling the flow of said fluid to nib 12. Such reservoirs are known in the art and often comprise a thin-walled plastic tube which is packed with a great number of fine plastic fibers, said fibers typically being aligned with the longitudinal axis of the aforementioned thin-walled tube to promote capillary wicking. One company which supplies reservoirs such as these is Filtrona Richmond, Richmond, Virginia.

Protective cap 13 is preferably designed in such a manner that it does not constitute a small parts hazard. Additionally, it is preferably of a vented design

whereby air may pass through its diameter longitudinally. Ventilated designs such as this provide an additional measure of safety should the cap accidentally be inhaled. Plug 15 retains reservoir 14 and may be used to urge reservoir 14 into contact with nib 12. Significantly, nib 12 is specially selected of materials which are acceptable for contact with food or food additives. Additionally, nib 12 must be selected from those materials which are soft and flexible so as to permit application of the food coloring agent to the food surface to be decorated while not significantly altering or displacing the food surface.

In the case of a frosted cake or cookie, nib 12 must be extremely soft. Nibs used in conventional arts and craft "felt pens" as well as those intended for application to food, described previously, are significantly more rigid than those which are satisfactory for application in the instant invention and may cause considerable damage to the surface of the food to be decorated. Extensive testing has shown that specially designed nibs which are fabricated from open cell polymers can function very well in the application of the instant invention. Similarly, suitable nibs may be produced by bundling a plurality of flexible fibers together into a loose group. The preferred embodiment however, employs nibs fabricated from porous, open cell polymer foams or sintered structures.

Particularly useful are foams prepared from polyvinyl alcohol systems which have been cross linked to form solid, open cell structures. The open cell structure may be formed by mechanically frothing the polyvinyl alcohol before cross